

Data report: Monitoring COVID-19 in Wastewater in the Chicago region

Report published March 16, 2022

Background

The [Illinois Department of Public Health](#) (IDPH), [Cook County Department of Public Health](#) (CCDPH) and [Chicago Department of Public Health](#) (CDPH) collect data from a variety of sources to understand the COVID-19 pandemic.

One novel way to monitor the spread of SARS-CoV-2, the virus that causes COVID-19, is by monitoring wastewater (also known as sewage). Even though SARS-CoV-2 is a respiratory virus, wastewater surveillance can be used to track its spread since the virus is shed in the feces of infected individuals. Unlike relying on reports from COVID-19 diagnostic testing, which are dependent on someone having symptoms or being able to access testing, infected individuals shed SARS-CoV-2 when using the toilet. By measuring the amount of SARS-CoV-2 in wastewater, public health officials may gather information about the amount of disease transmission on a community level.

Combined with other types of data, wastewater surveillance helps public health officials better understand transmission of SARS-CoV-2 in Chicago and the suburbs. Follow these links to read more about the wastewater monitoring program in [Chicago](#) and [Illinois](#). While IDPH tracks SARS-CoV-2 in wastewater across the state of Illinois, this report – in partnership with CDPH and CCDPH – describes recent wastewater monitoring data in the Chicago region.

The wastewater monitoring system in the Chicago region

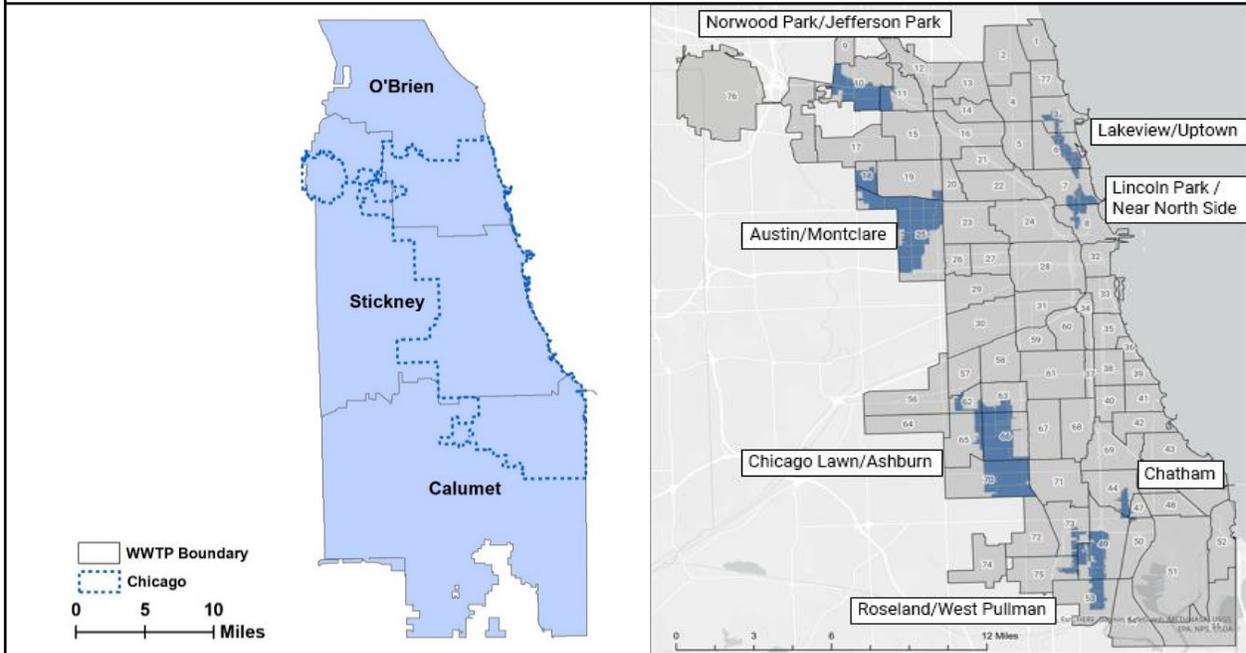
IDPH, CCDPH, and CDPH partner with the [University of Illinois Discovery Partners Institute \(DPI\)](#) and the [Metropolitan Water Reclamation District of Greater Chicago \(MWRD\)](#) to conduct surveillance at two main levels: wastewater treatment plants, and neighborhood sewers.

There are three large wastewater treatment plants serving the City of Chicago and suburbs of Cook County. Each of the O'Brien, Stickney and Calumet Water Reclamation Plants collect and process wastewater from over a million people. Samples are also collected from seven neighborhood sewers in Chicago, including one in each [Healthy Chicago Equity Zone](#). The number of people living in sewershed of the neighborhood sewers ranges from 3,600 to 215,000 people. The wastewater treatment plants and neighborhood sewersheds are shown in **Figure 1**.

Samples are collected from each plant and neighborhood sewer twice each week. As [recommended by the CDC](#), the concentration of SARS-CoV-2 is compared to the concentration of genetic material from Pepper Mild Mottle Virus (pMMoV). The pMMoV concentration reflects the amount of human waste in wastewater relative to other things like stormwater runoff.

Data from the local wastewater monitoring system is submitted to the CDC as part of the [National Wastewater Surveillance System](#) (NWSS). You can see NWSS data on the CDC's COVID-19 data tracker: <https://covid.cdc.gov/covid-data-tracker/#wastewater-surveillance>. In [January 2022](#), we reported data from the Chicagoland area demonstrating a clear increase in the amount of SARS-CoV-2 in wastewater in late 2021, which corresponded with increases in the number of incidence cases, hospitalizations and deaths due to COVID-19. This report extends analyses through February 15, 2022.

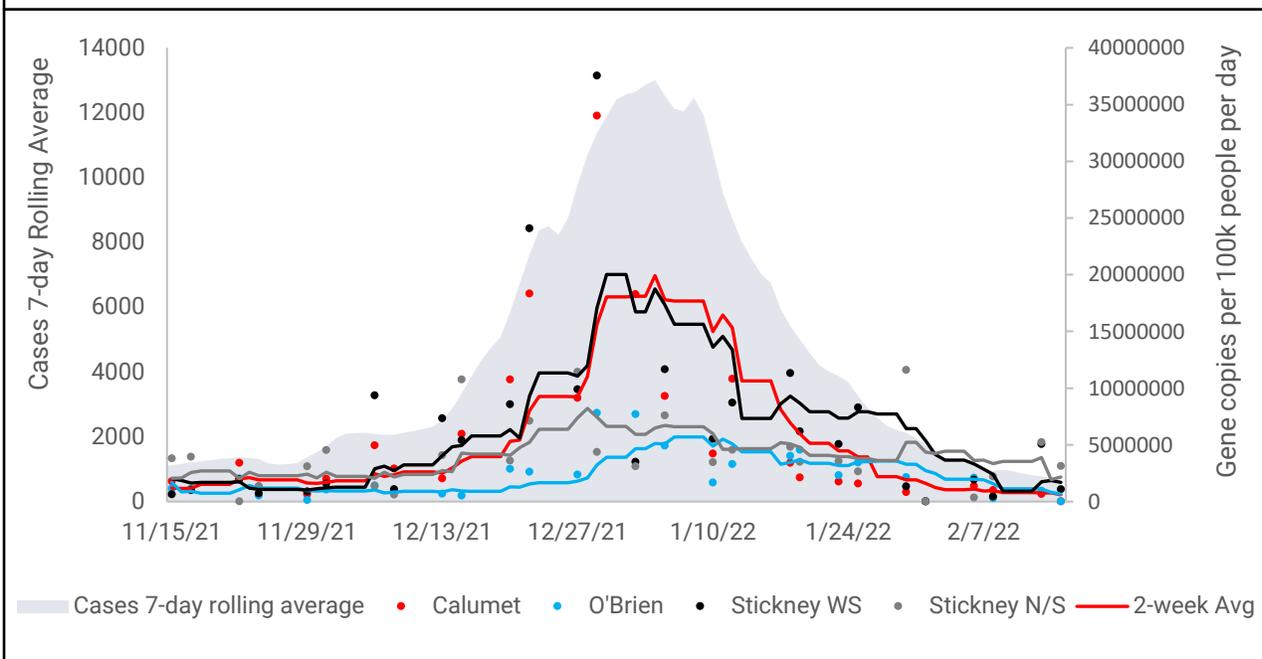
Figure 1: Wastewater treatment plants (left) and neighborhood sewers (right) that are monitored for SARS-CoV-2.



Wastewater concentrations in the Chicago region

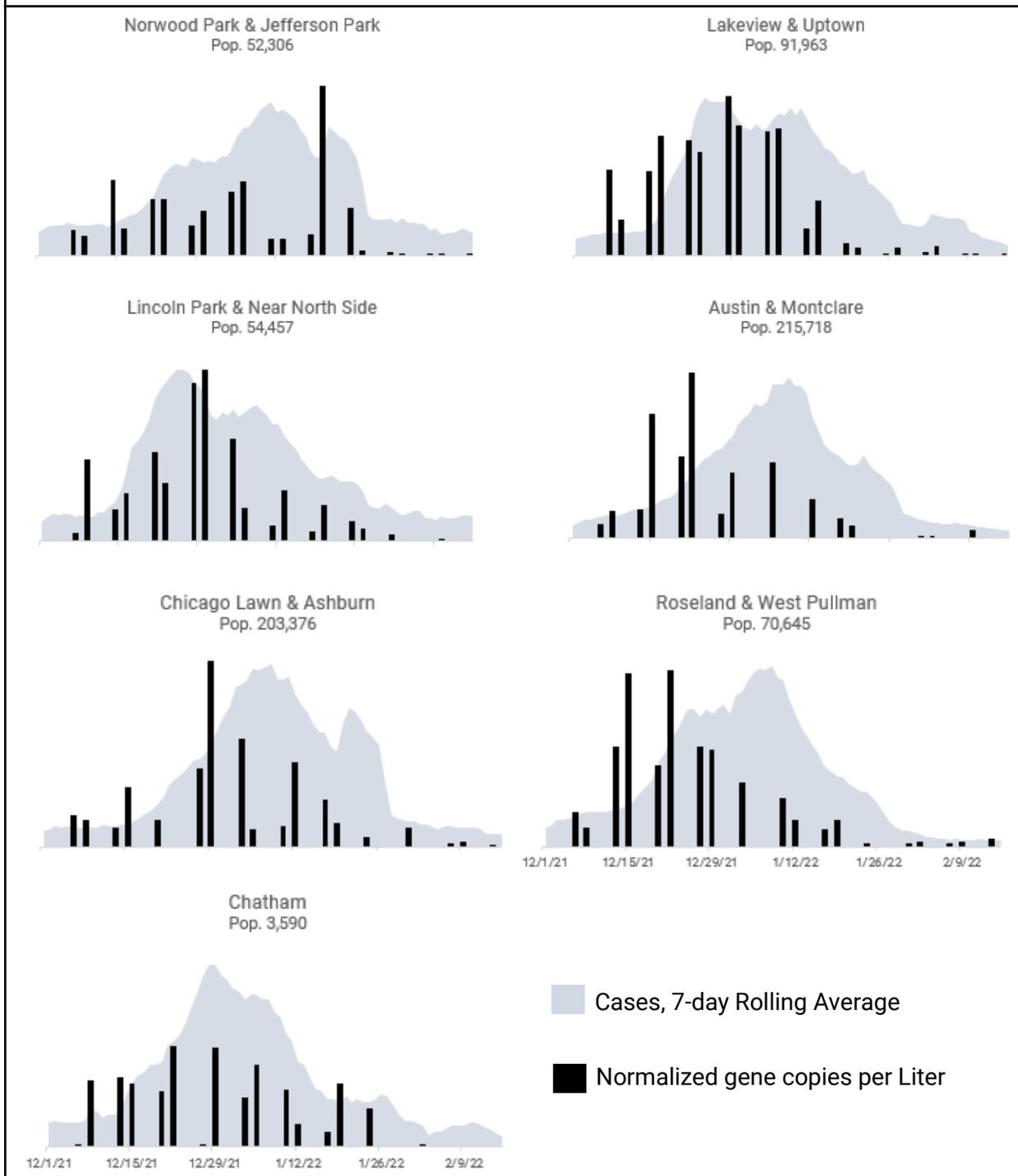
At the wastewater treatment plant level, increases in the concentration of SARS-CoV-2 in December 2021 were followed by decreases in SARS-CoV-2 concentration during January and February 2022. Trends in wastewater concentration closely mapped with trends in other COVID-19 metrics (**Figure 2**), with wastewater data appearing to lead case-based surveillance data.

Figure 2: SARS-CoV-2 concentration at wastewater treatment plants (lines) and 7-day rolling average of reported infections in Cook County residents (grey), November-February 2022.



At the neighborhood sewer level, increases in the concentration of SARS-CoV-2 in December 2021 were also followed by decreases in January and February 2022 (**Figure 3**). However, the trends in wastewater concentration appeared to map less closely to other COVID-19 trends than at the wastewater treatment plant levels, particularly in smaller sewershed areas with unstable flow. CDPH and DPI are working to understand and limit this variation

Figure 3: SARS-CoV-2 concentration in neighborhood sewers (black) and 7-day rolling average of reported infections in residents of the same area (grey), December-February 2022.



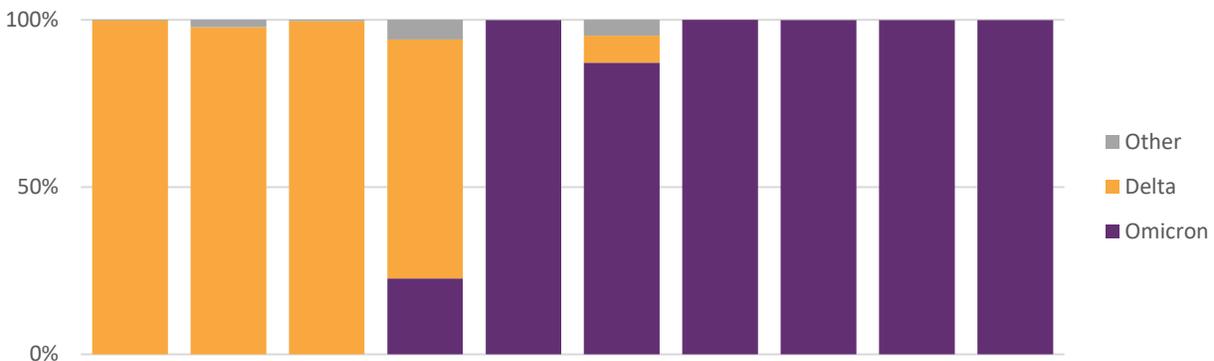
Monitoring variants of SARS-CoV-2

Like all viruses, SARS-CoV-2 constantly changes through genetic mutation. These mutations can lead to the emergence of new SARS-CoV-2 variants. Omicron and Delta are examples of SARS-CoV-2 variants of concern.

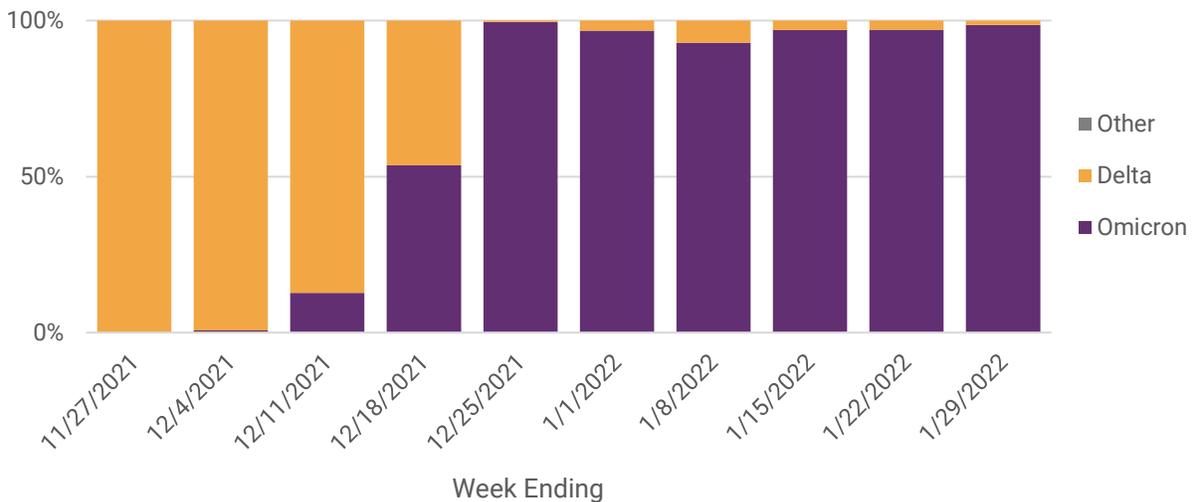
When SARS-CoV-2 is identified in wastewater, specialized laboratory testing including genomic sequencing can identify variants, including variants of concern. SARS-CoV-2 found in wastewater at O'Hare International Airport undergoes genomic sequencing to monitor the variants that are passing through the Chicago region. The Omicron variant was first detected in wastewater from O'Hare International Airport in mid-December 2021, and has been the dominant variant in wastewater since mid/late December 2021 (**Figure 4**). The majority of the Omicron variant that has been detected is the sublineage BA.1. On January 10, 2022, a sublineage of Omicron (the BA.2 variant) was detected in a single sample. These data are [similar to trends detected from genomic sequencing of clinical specimens](#).

Figure 4: Variants of SARS-CoV-2 identified through genomic sequencing of wastewater from O'Hare International Airport (above) and clinical isolates from the Regional Innovative Public Health Laboratory (RIPHL; below), November 2021 – January 2022.

O'Hare Airport International Terminal Wastewater



RIPHL Clinical Sequences



Summary

COVID-19 transmission has declined in recent months, and this decline was detected by wastewater monitoring at both the wastewater treatment plant and neighborhood sewer levels. Genomic surveillance of wastewater in the Chicago region corresponds to trends observed in clinical specimens.

What comes next?

IDPH, CCDPH and CDPH continue to refine wastewater monitoring systems in the Chicago region and across the state. As the availability of rapid At Home COVID-19 tests continues to increase, it is possible that a smaller proportion of COVID-19 cases will be reported to public health departments. Wastewater data, which is not affected by reporting to public health authorities, may become more valuable for monitoring levels of community transmission.

We anticipate continuing to produce reports in the future, and updated data is available through the [Wastewater Surveillance dashboard on the CDC's COVID-19 Data Tracker](#).

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